The Missing Link

The system of a chain, to link the camshaft to the crankshaft and drive other components to operate the engine, has been proven for many years by various vehicle manufacturers, particularly BMW. However, some engines are well known for common faults, the N47 engine in particular, is one of them.

In this article we investigate an example fitted to a BMW E61 520d, that had covered 180,000km and had an engine that suddenly stopped, due to a suspected timing chain failure.

The timing chain is located at the rear of the engine, close to the transmission and it is therefore necessary to remove the engine, to gain access to investigate the problem.

With the engine removed, the rockercover was taken off to view any damage. The camshaft chain was not visible and after inspection it was located at the bottom of the timing chain housing and also five rocker arms were broken.

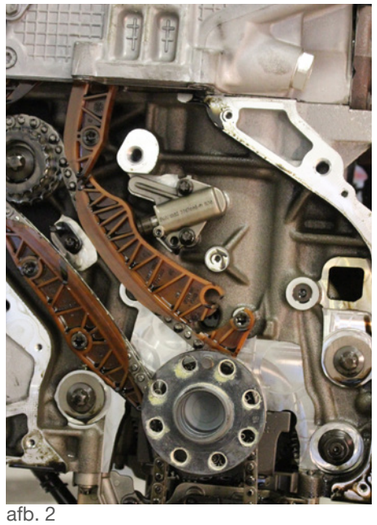
The camshaft support had sustained a significant fracture, which shows that a significant torsional force has been absorbed by the engine timing components. (Fig 1)

With the crankshaft locked in position, the clutch, flywheel and sump were removed for inspection.

After the removal of the timing chain housing, further damage was revealed. The upper chain had one broken link, the high-pressure fuel pump sprocket had broken teeth and the chain guide was also broken. (Fig 2)

This is a typical example of a chain failure on the N47 engine.

It was necessary to carry out a thorough inspection of the engine, to check for any other damage. In this case the intake camshaft did not rotate freely, it was twisted and did not fit properly on the bearings, and a replacement was required.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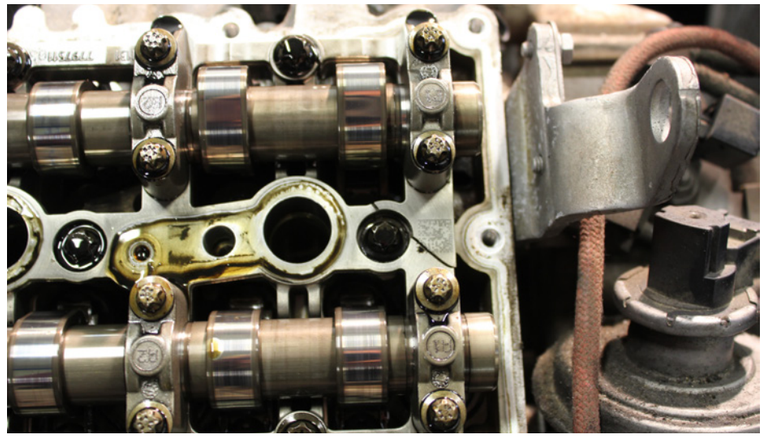
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Considering the damage already identified, it was necessary to check if the intake and exhaust valves had not collided with the pistons. The cylinder head was removed and the valves were checked, no problems were found, the valves had not come into contact with the pistons.

After a thorough inspection of the engine, all damaged parts were assessed for replacement.

When replacing a timing chain it is vital that all the components of the timing chain are replaced without any exception, failure to replace certain components can lead to serious consequences in engine operation.

The febi timing chain kit 102040 for this engine has all the necessary parts for the repair. The kit includes upper and lower chains, chain guides, tensioners and sprockets for the fuel injection pump and camshafts and also the oil nozzle for the lower chain.

This kit corresponds to the latest technical developments necessary to prevent the chain from breaking again. It has an upgraded version of the chain guides and superior quality chains treated with a TRITAN ® coating. This coating improves friction properties to reduce wear and optimizes engine fuel consumption.

The cylinder head was prepared for reassembly with a new camshaft support, camshaft and new rocker arms (febi 30132). Note: the tightening of the bracket bolts must not exceed 20Nm and it is important to ensure that the camshaft bearings are lubricated before installation.

The cylinder head was then reassembled and fitted to the engine block, using new bolts (febi 39779).

Then the timing of the camshafts and crankshaft was checked, this is essential for correct engine operation. The camshaft pinions have timing marks, which must be placed opposite each other parallel to the cylinder head. (Fig 3) The crankshaft is fixed by means of a pin in the flywheel, which is removed, we recommend that it be temporarily reassembled to check the locking.

First, the lower chain was installed with the new fuel injection pump sprocket and then the chain guides attached with their respective bolts.

The hydraulic tensioner was installed ensuring all contact surfaces with the engine block were clean before assembly. The lower chain and oil pump sprocket was installed, noting the direction of assembly.

The upper chain was installed from the injection pump sprocket to the sprocket of the intake camshaft. The upper chain guide can then be assembled, applying thread lock to the threads to ensure that they will not loosen during operation.

Once all the chains had been installed, the locking pin was removed from the hydraulic tensioner to the lower chain.

With all chains in place and the flywheel locked in position, the alignment was checked of the AAC markings on the cylinder head. As everything was correct, the camshaft sprocket was tightened with the three retaining bolts. If the alignment is not correct it can be corrected by turning the exhaust camshaft with a 32 mm spanner. Then check the fuel injection pump sprocket for the correct tightness.

The assembly of the febi 102040 timing chain kit was complete, the engine was turned over by hand for several revolutions to check that the engine was turning freely. (Fig 4)

The timing chain housing was reassembled with its new seal and the new crankshaft seal.

Once the valve timing had been reassembled, all other parts were reassembled before refitting the engine back into the engine compartment.

With the engine refitted, the oil filter was replaced and the engine was filled with the correct grade of oil. Regular engine


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oil and filter changes are vital for the long operation of all engine components, especially the timing chain as it relies on constant lubrication.

With the engine installed and the cooling system filled with fresh coolant, the engine was started and checked for leaks and correct operation.

The vehicle was road tested to check its performance, so that it could give many more miles of driving pleasure.

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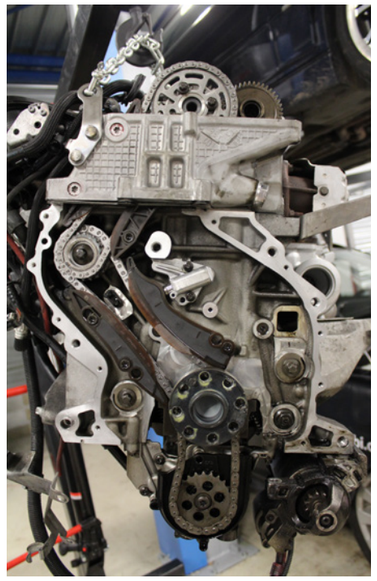
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